

REMARKS

By this Amendment claim 20 has been amended to recite the second solution additives of claim 34, claim 34 has been revised to list only two of the additives, claims 21 and 26 have been corrected, and claim 29 has been amended to depend from claim 26. Entry is requested.

In the outstanding Office Action the examiner has rejected claims 20-33, 36-39, 40 and 41 under 35 U.S.C. 103(a) as being unpatentable over WO 97/18166 in view of Lefebvre and Mickols, she has rejected claims 34-36 under 35 U.S.C. 103(a) as being unpatentable over these same references, further in view of Herron et al., and she has rejected certain claims, including claims 34-39, under 35 U.S.C. 103(a) as being unpatentable over Yaeli in view of Mickols and Lefebvre.

It is asserted that these rejections cannot apply to amended claim 20.

The examiner admits that none of WO 97/18166, Lefebvre and Mickols disclose an anti-fouling agent or disinfectant in their second solution (item 3 in Office Action). She cites Example 4 in Herron et al. as a basis for adding such an agent.

It is respectfully submitted that there is no basis for the examiner's assertion. Example 4 of Herron et al. is directed to a process for producing instant coffee or liquid coffee concentrates. The process involves contacting one side of a membrane with coffee and the opposite side of the membrane with a concentrated solution of osmotic agent. The

difference in osmotic potential causes water to flow across the membrane from the coffee-side of the membrane into the osmotic agent solution. After 8 to 10 hours of use, the membranes are cleaned to remove coffee deposits from the membrane. The cell is then washed with an ULTRASIL detergent. Unlike the claimed invention, therefore, there is no disclosure or suggestion of using an anti-scaling agent, corrosion inhibitor, anti-fouling agent or disinfectant in the second solution. Although, Herron et al. recognize that coffee deposits can form on the coffee-side of the membrane, this patent indicates that such deposits should be removed by interrupting the process and flushing the membrane with water. This is a completely different concept from that of the present invention.

The examiner has suggested that, in the light of Herron et al., it would be obvious to a person of ordinary skill to provide an anti-fouling agent within the osmotic agent solution. There is no basis for the examiner's assertion. In Herron et al., the deposits are removed by interrupting the osmosis process and flushing the membrane with water. Although the cell is contacted with an ULTRASIL detergent, this detergent is used to clean the cell once the membrane deposits have been removed. The detergent is then deliberately rinsed away (see column 14, lines 40 to 41). There is therefore nothing in Herron et al. to suggest that the detergent may be retained in the osmotic cell. If anything, Herron et al. teach away from this concept by indicating that traces of the detergent should be removed in the final rinsing step.

More importantly, it is apparent from Example 4 that the deposits formed on the membrane are coffee deposits (see column 14, line 37). Accordingly, these deposits come from the coffee-side or first solution-side of the membrane. Even if a person of ordinary skill were to consider adding anti-fouling agents to the osmotic cell, he would have no reason to add such agents to the solution of osmotic agents, since the fouling occurs from the coffee-side. If anything, therefore, he may be inclined to add such additives to the coffee or first solution. There is no reason to use anti-fouling agents in the second solution as there is no suggestion in the prior art that this solution plays any part in membrane fouling.

In the present invention, a first solution, such as seawater, is contacted with one side of a membrane under direct osmosis conditions. A second solution, such as a divalent salt solution, is contacted with the opposite side of the membrane. Since the seawater contains a significant proportion of contaminants, a person of ordinary skill may expect fouling to occur on the seawater side of the membrane. As with Herron et al., therefore, a person of ordinary skill might be inclined to add anti-fouling agents to the seawater. However, since the second solution is substantially pure, he would not expect this solution to cause any membrane fouling.

The present inventors, however, have found that during the direct osmosis step, a significant proportion of contaminants from the seawater are carried across the membrane in the direct osmosis step. This is

surprising because one would not expect such a large flux of contaminants to occur against the concentration gradient. The invention, therefore, resides in the realization that the flux of contaminants from seawater is sufficient to cause membrane fouling in the subsequent nanofiltration step. This would not be expected given the pore size of the membrane, the concentration gradient across the membrane and the initial purity of the second solution. In fact, none of the prior art documents envisage the possibility of such a significant flux of contaminants occurring across the membrane in the direct osmosis step. In this regard, WO 97/18166 teaches away from this possibility by indicating that, in the direct osmosis step, contaminants in the feed stream do not cross into the osmotic agent (see page 6, lines 35 to 37). In view of the above, a person of ordinary skill reading the prior art would have no reason to include additives, such as anti-fouling agents in the second solution. Contrary to the examiner's suggestions, therefore, this feature of the invention is not obvious over the prior art.

With respect to the examiner's prior art rejection based on Yaeli in view of Mickols and Lefebvre, this should be withdrawn as none of these patents would suggest adding an anti-scaling agent, a corrosion inhibitor, an anti-fouling agent or a disinfectant to a "second" solution.

It is requested that the presented claims be allowed.

Respectfully submitted,

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